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THE HABITAT OF PLANTS.

BY CHARLOTTE L. LAURIE,

Author of "A Text-Book of Elementary Botany," "Flowering Plants."

IN choosing a subject for my address this afternoon, I felt that some account of work I had been doing in botany the last three or four years might perhaps prove of interest, for although it can in no sense claim to be original, it is on fairly new lines, and as far as I know there has not yet been written very much in English on this subject—there is more in German.

I have been trying to observe, as accurately as may be, what plants grow together in hedges, in meadows, in woods, on moors, on hills, in bogs, etc.; which grow by the sea, which are found in running water, which by the side of running water, etc. Then to a very limited extent I have tried to notice how far the structure of plants is adapted to their habitat, thus if possible to account for the difference in plants.

My method has been somewhat as follows:—Supposing the flora of a hedge was being observed, the aspect, the nature of the soil beneath the surface mould, the degree of moisture, whether there was water trickling down the bank beneath the hedge, were first noted as far as one's knowledge permitted. Then the framework of the hedge, whether hawthorn, or privet, or elm, etc. Lastly, the herbaceous growth, which generally subdivides itself into: (1) climbing plants that straggled up to the top of the hedge, and (2) plants not capable of climbing that formed an undergrowth sheltered by the hedge from the sun. The results of observations on hedges tend to show:—

(1) That the majority of plants which reach the top of hedges are climbing, *e.g.*, convolvulus, hop, clematis, bryony, etc.

(2) That hedges which were more or less damp had their characteristic undergrowth differing from that of less well watered banks.

(3) As yet, I have not been able to arrive at any conclusion with regard to the relation of the undergrowth to the framework of the hedge. Most of the hedges I have come across are hawthorn and many more observations are necessary on

other hedges, before it would be possible even to suggest any theory of relationship.

Climbing plants are interesting from the point of view of adaptation to habitat: there is such a variety in the climbing organ. The convolvulus, for instance, twines by its stem, and makes use of literally anything that comes in its way. I untwined several plants this summer which had twisted themselves round grass; it was quite wonderful to see how the slender grass was able to bear the weight of the convolvulus. After it had reached the top of the grass, the edge of the twining stem seemed to swing to and fro in the air until it came in contact with another plant, very often stinging-nettle. Thus from grass to stinging-nettle, from nettle to hedge parsley, or some other plant, often one of the Umbelliferæ, the convolvulus made its way up to the hedge and then the pinkish-white flowers peeped out between the hawthorn leaves. Clematis, on the other hand, climbs by means of its petioles, which are often intertwined with bramble—a plant that attaches itself to the hedge by its prickles. It would be interesting to know why some plants should climb by means of prickles, others by petioles, etc. This is a very large question and involves many other considerations. A plant tends to have prickles when it lives in dry, stony soil, and the use of prickles for climbing purposes may be a secondary modification.

The plants found in woods are in some ways more easy to map out. In making observations on a wood, it is best to begin with woods where some one tree is distinctly prominent, beech, or oak, or fir, etc. Many woods are very mixed and then the undergrowth is more or less mixed too. The fir wood does not yield much undergrowth; the beech is rich in spring plants, but practically has only plants that can do without sun in the summer; the oak has the richest undergrowth of these three trees.

The thickest part of the wood should be observed, then the fringe of the wood, where there is more light. The undergrowth is always richer at the fringe of the wood than in the depth of the wood. Beech woods are the ones I know best, as they abound on the Cotswolds. With the help of some of my pupils, two years ago we mapped out small areas of the Birdlip woods. (See *Flowering Plants*, p. 150).

This summer, in the north of England, I investigated carefully the undergrowth of very mixed woods. Amongst the hundred and more plants found, there were only three which I had not already found in woods in the midland and southern counties. These were Sweet Cicely, Wood Geranium, Giant Campanula. These seem to belong to the north of England.

As far as I can see at present, a few degrees of latitude make little difference to the flora of a district: height above the sea level is of far more importance. Further, there exists a close resemblance between plants found on the sea-shore and plants found on high hills or on mountains.

Two years ago I spent a good part of the summer holidays working at sand plants; this summer I examined a good many plants growing on the tops of the hills round Cheltenham. Such observations as I was able to make on sand plants (*Halophytes*) were carried on in the month of August, at a little village on the Northumberland coast, where the sand was practically undisturbed. The village is still in a fairly primitive condition; bathing machines have not yet made their appearance, there was no esplanade, the church was situated at the extreme end of the village, and so near the sea that in stormy weather the waves beat against the wall, and the approach to the church is through inches of sand. I mention these details to show that the natural features of the place have been, comparatively speaking, little interfered with by man and therefore the conditions were all the better for botany. Not only were there long stretches of sand, sand-dunes, etc., but inland, a hundred yards or so from the sea, stretched miles of moor on which here and there boggy patches would be found, with distinct water plants (*Hydrophytes*). Off the moor on the roadsides were hedges with mesophytic plants; meadows were on the whole scarce, but enough has been said to show that the place offered a variety of flora—sand plants, moor plants, water plants, hedgerow plants.

Sand plants. First, a list was made of those which grew on shifting sand, *i.e.*, sand which is blown about by the wind so as to cover plants that grow in it, which have to push their way up again. The most conspicuous plant in these shifting sands was the grass "psamma," which binds the sands together, gradually converting shifting sand into firmer sand, from which sand-dunes could be built up. Where the sand was very shifting, even this grass was not thick, and was easily pulled up, but as the sand got firmer the grass got thicker, and then other plants began to appear, *e.g.*, *Arenaria peploides*, *Cakile maritima*, *Sasola kali*, *Salicornia*. I several times found these plants covered up with sand, so that they were almost entirely buried beneath it. It is comparatively few plants that can stand this. In the shifting sands covering the rocks (not on the shore), I found sea plantain and *Atriplex petula*, in the clefts of the rocks where no doubt the shifting sand had penetrated, *Cochlearia officinalis* and *Glaux maritima*.

The next observation was made on sand-dunes, where the sand by the instrumentality of the plants just mentioned, had been woven into firmer texture. Here the grass psamma was very abundant, also *Elymus maram;* creeping Rest-harrow literally carpeted the ground and it was interesting to compare the rest-harrow growing on these sand-dunes with the rest-harrow growing inland, the one in the sand had long creeping stems, the inland species was decidedly more upright. Yarrow was very common, here again there was a good deal of difference in yarrow as we know it inland, say in Gloucestershire, and yarrow as I found it there; the leaves were quite close to the ground, so that the yarrow combined with the grass to give almost a lawn-like appearance to the sand-dune in parts. In many cases, this yarrow was only two or three inches high. *Erodium* was very common on these sand-dunes and in one particular spot *Rosa pimpinella* and *Geranium sanguineum* were found in abundance. Many other plants, common all over England, were also found on these sand-dunes, viz., shepherd's purse, *Galium verum*, dock, stinging-nettles, groundsel, thistles, ragwort, clover, *Bellis perennis*, etc. *Geranium sanguineum* was very local, but abundant. Lastly, on the cliffs, exposed to the sea breezes, but not on the sand, was sea-thrift in abundance, also stonecrop.

The next thing I did was to compare carefully all those plants which as far as I knew grew only at the sea, on sandy soil. I therefore put on one side any plant which I had found anywhere else; this left the two grasses, Psamma and Elymus, *Arenaria peploides*, *Cakile maritima*, *Salsola kali*, sea plantain, sea-thrift; perhaps one may include in this list

Erodium, but I think I found that at Haresfield. All these plants had either long roots, or long underground stems; very fleshy leaves, often thorny; were creeping in habit; short, even stunted; in fact they showed the typical xerophytic characters. I think it would be safe to conclude—not of course merely from these observations—that sand plants are distinctly xerophytic.

The following are some of the plants I picked on June 25th, from the top of Haresfield Beacon, near Gloucester:—Black medick, with a small yellow flower like yellow clover, but always recognised by its spiral black fruit; thyme; rockrose; a variety of thistles—the genus *Carduus* mostly; geranium molle; field alchemil; very small salad burnet; hounds-tongue. Now these are, for the most, small, stunted plants, and if the species, say of black medick, found on the top of a hill some seven or eight hundred feet high is compared with black medick found on a roadside, the valley plant is of larger growth usually. Things that grow by the sea are often stunted compared with the same species growing inland; in both cases there is a tendency to thorniness and to reduction of the leaf surface, because these plants are exposed to dry atmospheres; if they live on the top of a hill, they do not get as much water as they would in a valley, and plants living in sand have likewise to adapt themselves to a very varying supply of water.

Last summer I made some observations on *Bogs*. July is the best month to see the bog flora in its perfection; in August, only a few of the plants are still in flower, the majority have begun to form seed vessels; still a good deal can be found even in August.

The plants found in bogs depend largely on the character of the humus; if it forms peat and contains humic acid, the vegetation will be different from that of bogs which are not peaty. Peat forms a compact crust which lies on the mineral layers of the soil, it is permeable to water but does not pass it on, it holds it like a sponge and on the surface of the peat the water collects in little pools, it is in these that certain rare plants should be looked for. Peaty bogs are characteristic of our fells in the north, *e.g.*, the Lake district, or of Scotch mountains.

A typical bog will have tufts of heather growing in the drier parts. Many bogs are almost carpeted with Sphagnum or bog-moss; but this moss, though very abundant in bogs, is by no means confined to it; in many moors it forms so considerable a feature that they are called "sphagnum moors." It is only found where peat is present. Where the stretch of bog land is very extensive, it is locally called a "moss," and it is there that the greater variety of plants will be found. In the pools will be found Bladderwort, of which the most common species is about six or eight inches high, the leaves are very much divided and bear little green bladders. The flowers are yellow and are plentiful in July, they are large and conspicuous for the size of the plant, two-lipped and showing above the surface of the water; in August they are nearly over and only an occasional one will be found.

Scattered over the bog, not in pools, but clinging to the firmer parts of the soil, another insectivorous plant will be found, Butterwort. This is not specially a bog plant, it is often found on wet rocks and on the sides of the rills that trickle down our mountain sides, in fact, in some parts of Scotland it is found on the very mountain paths themselves. This flowers early in the summer, putting up a stalk from three to five inches high, with a single handsome bluish-purple flower.

Sundew, another insectivorous plant, is also abundant in bogs, but it is curious how rarely one finds the flower well out. Constantly it is seen well on in bud, but hardly ever fully open; it seems to require bright sunshine to make the flower expand.

It is interesting to enquire why insectivorous plants should be found in boggy regions. The fact that peat does not contain much nitrogen accounts for the presence of these plants, which get the nitrogen from the bodies of the insects on which they feed. (See *Flowering Plants*, p. 15.)

On the sides of the pools a very delicate little plant, the Bog Pimpernel, is often found. The whole plant is only a few inches long, with small round leaves opposite each other and a pale pink flower on a long slender stalk. This is found in the Lake district, and in the West of Britain more frequently than in the East. It flowers in August.

A most beautiful sight is to see a bog covered with Bog-Asphodel. July is again the best month for this; in August the bright yellow flowers have given place to reddish-brown seed vessels, which stand straight up in spikes above the surface of the bog. This plant belongs to the order Liliaceæ and is a rare instance of a species common to Europe and North America, but not extending over Asia.

The Grass of Parnassus flowers in August, and is also a bog inhabitant. Before the flower opens, the buds look like round balls, through the green calyx of which the white petals may be seen. When the flower expands, the petals, which are fairly large, spread out revealing the stamens, which bear tufts of ten or twelve short filaments each with a little yellow globular gland.

One more bog plant must be mentioned and that with a flower of very delicate colouring, the buck-bean. This flowers early, even July is late for it and by August only seed vessels are to be found. The flower is white, tinged with red, and delicately fringed on the inside.

Teaching of Botany to Young Children.—The following observations may be made in a garden: (1) The planting of seeds, the coming up of the first leaves, the growth of the shoot until flower is formed. The child might have similar seeds growing in a window box, or in a room indoors, and the growth of the seed indoors compared with that in the garden. It would be more possible to observe growth constantly if the seeds are indoors.

(2) The arrangement of leaves on stems. There is endless variety—in a square stem the leaves are often arranged in pairs, two opposite on two sides of the stem, the next two on the other two sides and so on. In this way all the leaves are exposed to the sun and can get light. It would be possible for a small child to count how the leaves are arranged in other plants; sometimes the sixth is over the fifth and so on.

Then the way in which raindrops in a slight shower fall from one leaf to another and on to the ground, making a circle round the plant, may be noticed, so that it is possible to stand under a tree during a slight shower without getting wet; the roots spread to the circumference of the tree.

With this may be compared a plant like rhubarb, where the leaves come up radically; the water there runs in towards the centre of the plant, because this root is a tap-root without the same extent of lateral branches found in other plants.

If it is possible to get walks in the country, a very interesting thing to do is to keep a record of plants as they flower in the spring; in a year like the present it would be interesting to make a list of the dates on which plants are still found in flower.

Even in London a great deal can be done in observing trees: there is the ubiquitous plane—its peeling bark, its protection of buds, its tasselled fruit, the shape of the leaf, etc., can all be observed. Then in the parks and gardens there are many other trees which would afford plenty of material.

It is a good plan to encourage drawing of everything, and children always find this interesting. The drawing of leaves teaches accurate observation of the shape; there is so much to notice in a leaf before it is possible to draw it properly. First, the fact of its structure, stalk with sheath or stipule sometimes, then the blade, the outline, the veining, the margin —whether ciliate as in the beech, dentate, etc. It is a good plan, too, to try to paint a plant. Work of this kind is better than mere drying plants and collecting them. Possibly, too, small children would be interested in drying plants in sand, their mode of growth is much better preserved than by pressing them, but painting is best of all, as it is impossible to give any even tolerably correct idea of the growth of a plant in a painting without looking at it thoroughly.

As far as possible, young children should observe Nature as she is. The surroundings of a plant should be noticed, and might it not be possible for a child to have a bed or beds in a home garden, where he transplanted any common plants (not rare ones) trying to reproduce the natural surroundings? A little rockery might be made in part of the bed, where plants growing on stony soil would be placed; under a tree some of the plants forming the undergrowth of woods might flourish, etc. We have a small botanical garden in Pittville, Cheltenham, where some three to four hundred Gloucestershire plants have been transplanted and an attempt has been made to reproduce their natural surroundings with considerable success. Boys especially, I think, would be interested in doing something of this kind.